

K. SUBRAMANYAM* and L. L. NARAYANA**: **A contribution to the floral anatomy of some members of Melastomataceae**

スブラマニヤム・ナラヤナ： ノボタン科植物の花部解剖

The floral anatomy of Melastomataceae has not received much attention. Saunders (1937) studied three genera mainly to support her theory of Carpel Polymorphism. Recently Van Heel (1958) studied the vascular anatomy of the pistil of *Bertolonia marmorata*. Wilson (1950) studied the vascular anatomy of the stamens in the family. Morley (1953) revised a section of the genus *Mouriri* on the basis of anatomy and morphology. Recently Eyde and Teeri (1967) described the vascular anatomy of *Rhexia virginica*. The present study deals with the floral anatomy of the following six species of the family: *Sonerila pulneyensis* Gamble, *S. rotundifolia* Bedd., *S. wallichii* Benn., *Osbeckia crinita* Naud., *Oxyspora paniculata* DC., *Memecylon sylvaticum* Thw.

Material and methods The material collected from various parts of India was fixed in formalin-acetic-alcohol. Customary methods of dehydration, infiltration and imbedding were followed. Serial transverse sections, cut at a thickness of 10–12 microns, were stained in crystal violet using erythrosin as the counter stain.

Flower The flower is bisexual, regular and epigynous. It is trimerous in *Sonerila pulneyensis* (Figs. 5–11), *S. rotundifolia* (Figs. 16–26) and *S. wallichii* (Figs. 29–37) and tetramerous in *Osbeckia crinita* (Figs. 42–50), *Oxyspora paniculata* (Figs. 56–64) and *Memecylon sylvaticum* (Figs. 72–78). The floral parts in these species show adnation and become free at the top. The free sepals and petals are valvate and contorted respectively in all the species (Figs. 12, 24, 37, 50, 64, 78). In *Osbeckia crinita* (Fig. 49) and *Memecylon sylvaticum* (Fig. 78) the sepals are united into a tube for a short distance after their separation from the floral tube. The androecium consists of three stamens in *Sonerila* species (Figs. 10–11, 19–24, 32–37) and eight in the rest (Figs. 45–48, 59, 60, 73–76). In the bud condition the stamens are bent inwards with the result they appear extrorse in transverse sections of flower

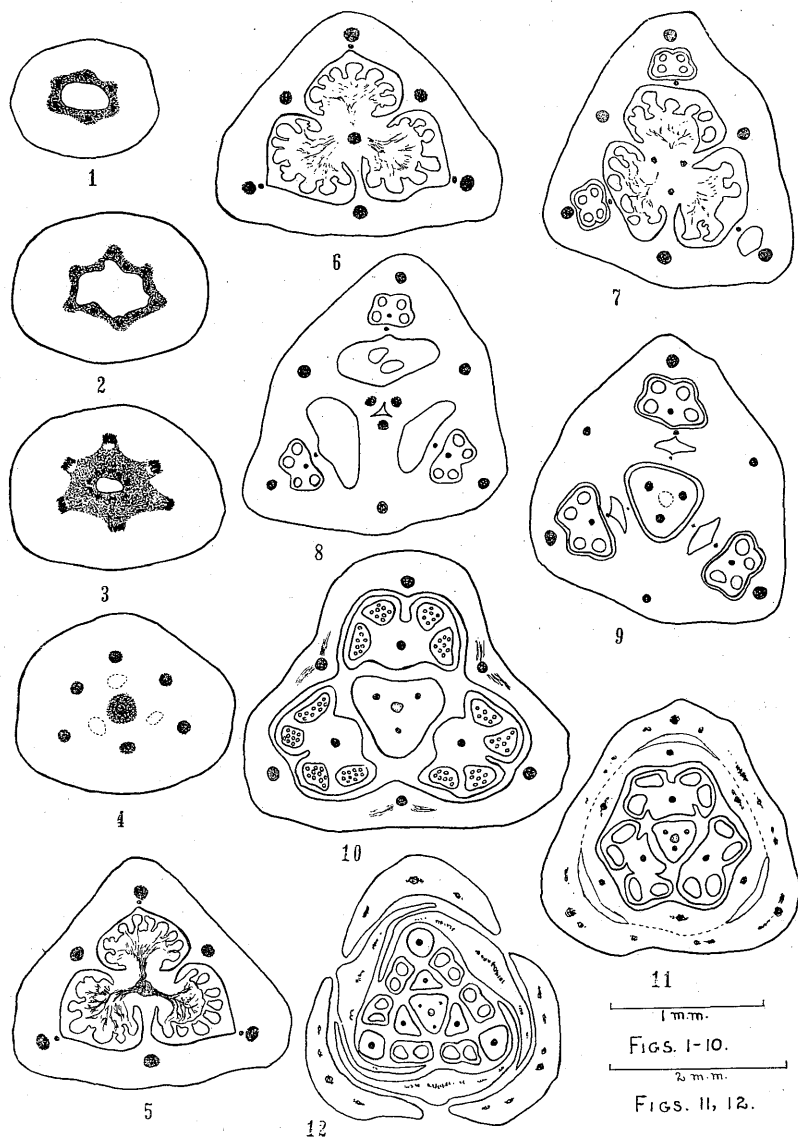
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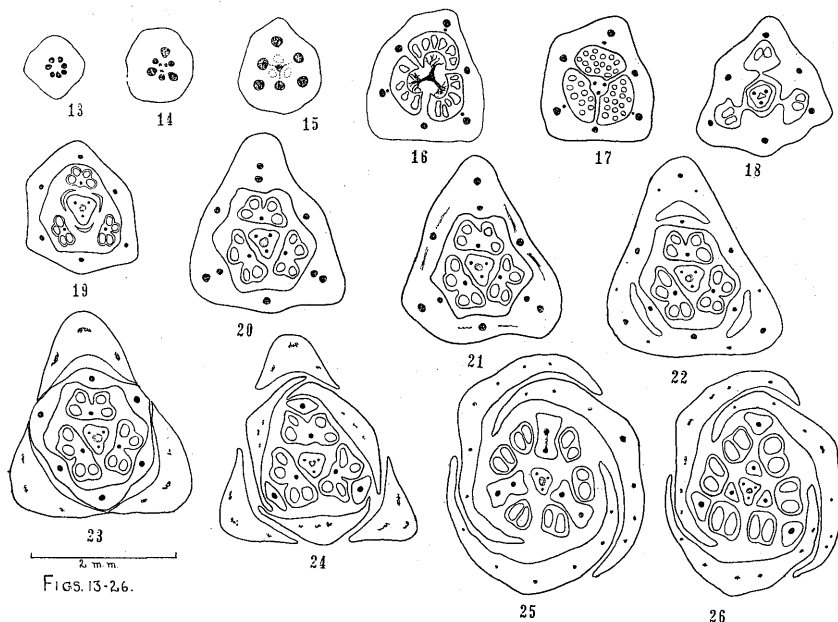
buds (Figs. 10-12, 19-24, 32-37, 46-48, 56-60, 74-76). In all species, except *Memecylon sylvaticum*, there are as many cavities as the number of stamens in the floral tube, opposite the perianth lobes. The distal portions of the incurved stamens are located in these cavities in the bud condition. The stamens in *Osbeckia*, *Oxyspora* and *Memecylon* are of two lengths; the antisealous being shorter than the antipetalous stamens. Further, the connective of the anther in these species, is prolonged into a characteristic appendage, and below the base of the connective the anther lobes are drawn apart. In *Memecylon* this appendage in addition bears a nectary (Figs. 79, 80). The staminal bundle after reaching the connective gives a branch to the appendage, and thus in turn ends near the base of the nectary (Fig. 80).

The inferior ovary is tri-carpellary in *Sonerila* (Figs. 5-7, 16, 17, 28-30) and tetracarpellary in *Osbeckia* and *Oxyspora* (Figs. 42-44, 56-59), syncarpous, with as many loculi as the number of carpels. The massive placentae project into the loculi and bear numerous ovules. In *Memecylon* the inferior ovary is unilocular with 8-10 ovules borne around the apex of the axis of the free central placenta (Figs. 70, 71). The ovary wall projects into the ovarian cavity above the point of origin of the style. The style shows a stylar canal lined by transmitting tissue (Figs. 9-12, 19, 26, 35-37, 47-50, 61-64, 74-78).

Floral anatomy At the base of the inferior ovary, the main stele shows a ring of six discrete vascular bundles in *Sonerila rotundifolia* (Fig. 13) and *S. wallichii* while in *Memecylon* there are eight bundles (Fig. 65). In the rest of the taxa the main stele is a closed ring (Figs. 1, 38). At this level the cortex in *Osbeckia* shows 6-8 bundles which divide repeatedly into smaller bundles; these traverse the ovary wall along with the other bundles (Figs. 38-48). In *S. rotundifolia* and *S. wallichii*, three of the six stelar bundles diverge outwards from the inner three which in turn divide tangentially forming an innermost group of three bundles (Figs. 14, 27) and these constitute the ventrals. Next, the outer and inner bundles move towards the periphery (Figs. 15, 27). In *S. pulneyensis* six traces arise from the ring-like main stele (Figs. 2, 4) while in *Osbeckia* and *Oxyspora* eight such traces are formed (Figs. 40, 52); in the latter taxon, the eight traces arise in two whorls of four each (Figs. 51, 52). Now the main stele forms a central core of vascular tissue in *S. pulneyensis* (Fig. 4); in *Oxyspora* it forms a ring from which four dorsal carpellary traces are given off along the sepal radii before the forma-

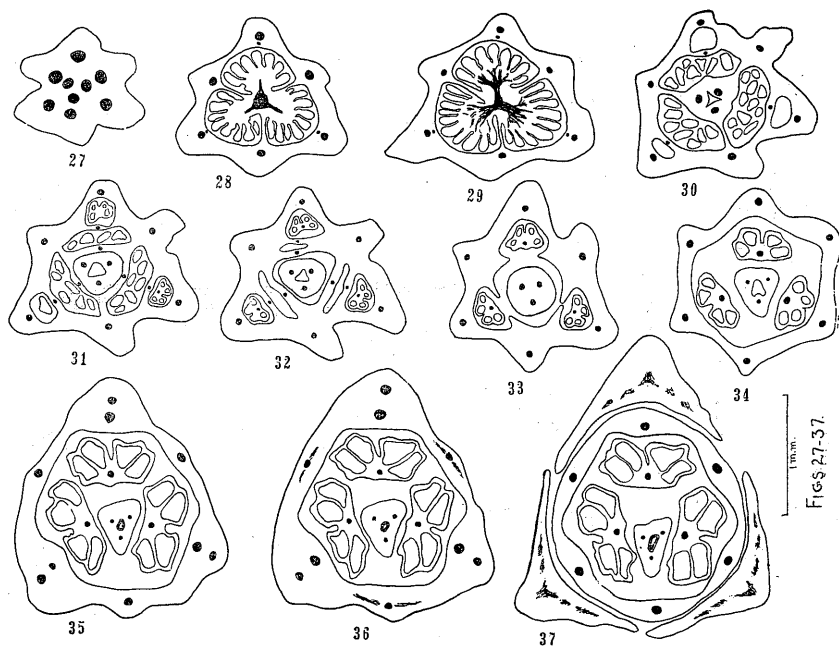


Figs. 1-12. *Sonerila pulneyensis*. Cross sectional figures representing various levels from pedicel upwards in the flower.



Figs. 13-26. *Sonerila rotundifolia*. Cross sectional figures representing various levels from pedicel upwards in the flower.

tion of the common ventrals (Figs. 52, 53). The common ventrals in *S. rotundifolia* and *S. wallichii* unite to form a central core of vascular tissue (Figs. 14, 15, 27, 28). In *Osbeckia* and *Oxyspora* the ventrals unite to form a ring of vascular tissue instead of forming a solid core (Figs. 41-43, 54-59). The placental supply is organised from the central vascular tissue which is either ring-like or in the form of a solid core. Besides, branches are also given off to the ovary wall in *Oxyspora* (Figs. 57-59). The numerous ovules derive their vascular supply from the placental strands. At the level where the placentae cease to exist the central vascular tissue becomes organized into as many bundles as there are carpels (Figs. 8, 17, 30, 44, 60). These lie along the septal radii and extend further up to constitute the stylar supply (Figs. 9-12, 18-25, 31-36, 47-50, 61-64). In *Osbeckia*, in addition to the bundles formed above the level of the placentae a few vascular elements are met with in the centre recalling the residual stele (Figs. 44-46). However, they fade away soon. Further, in *Osbeckia* the four bundles traversing the style divide

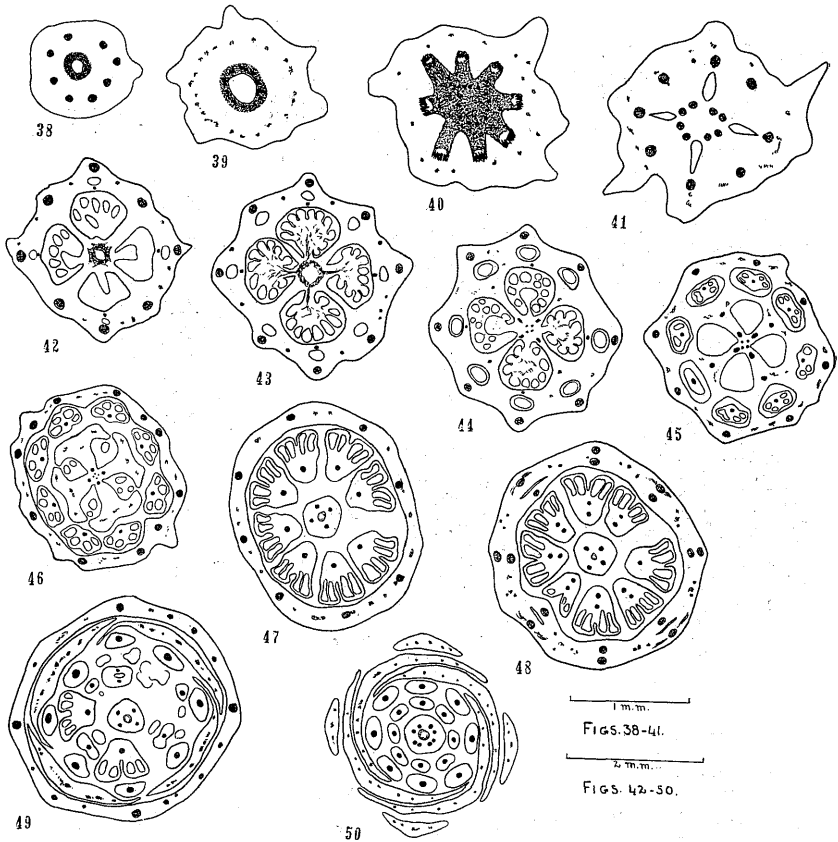


Figs. 27-37. *Sonerila wallichii*. Cross sectional figures representing various levels from pedicel upwards in the flower.

into two with the result eight bundles traverse the style at higher levels (Fig. 50).

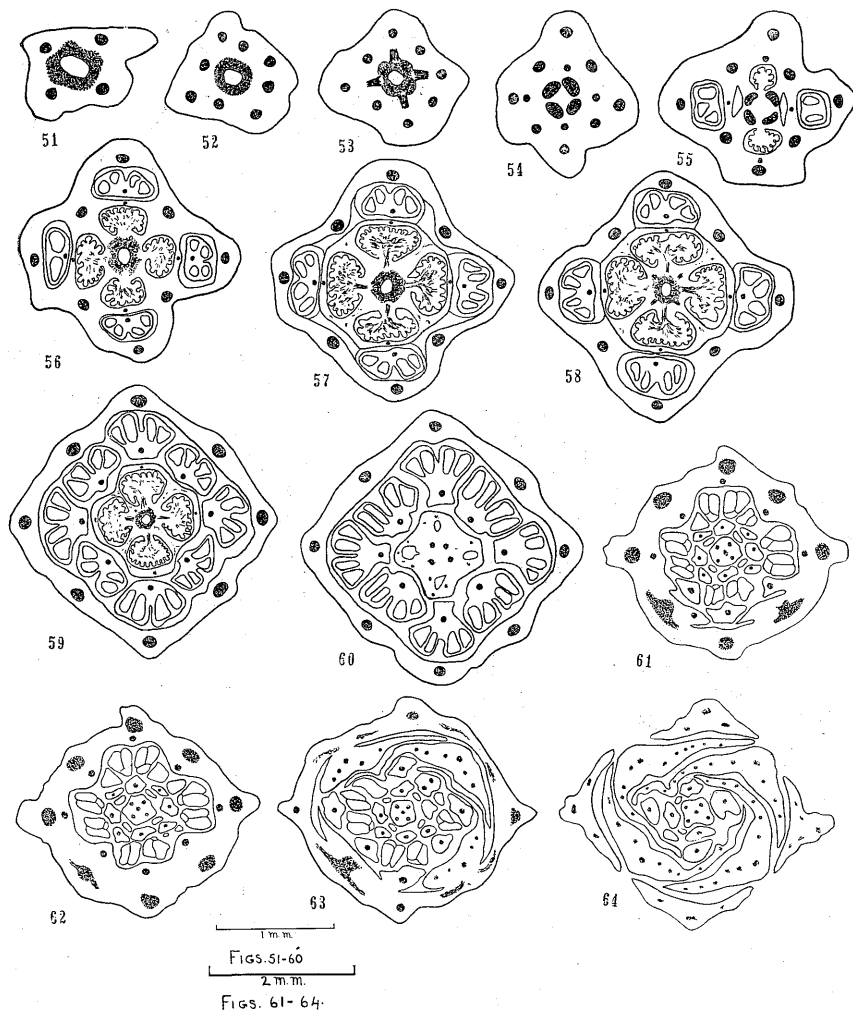
The six or eight prominent bundles that traverse the floral tube supply the perianth and stamens. In *Osbeckia* the floral tube is traversed by smaller bundles in addition to those that supply the stamens and perianth (Figs. 39-49). In both *Sonerila* and *Osbeckia*, the bundles lying opposite the loculi of the ovary divide twice in a tangential manner. The first division results in the delimitation of the dorsal carpellary traces and these fade away towards the top of the ovary (Figs. 5-9, 16-18, 28-32, 42-45). The second division separates the medians of the sepals and the antisepalous staminal traces (Figs. 11, 20-24, 35-37, 48, 61-63). There is thus adnation between the medians of the sepals, antisepalous staminal traces and the dorsal carpellary traces.

The bundles in the ovary wall lying along the septal radii function as the common sepal lateral-petal medians in *Sonerila* species (Figs. 9-11, 20-23, 35-37). After demarcation of the sepal marginals of the adjacent sepals, the



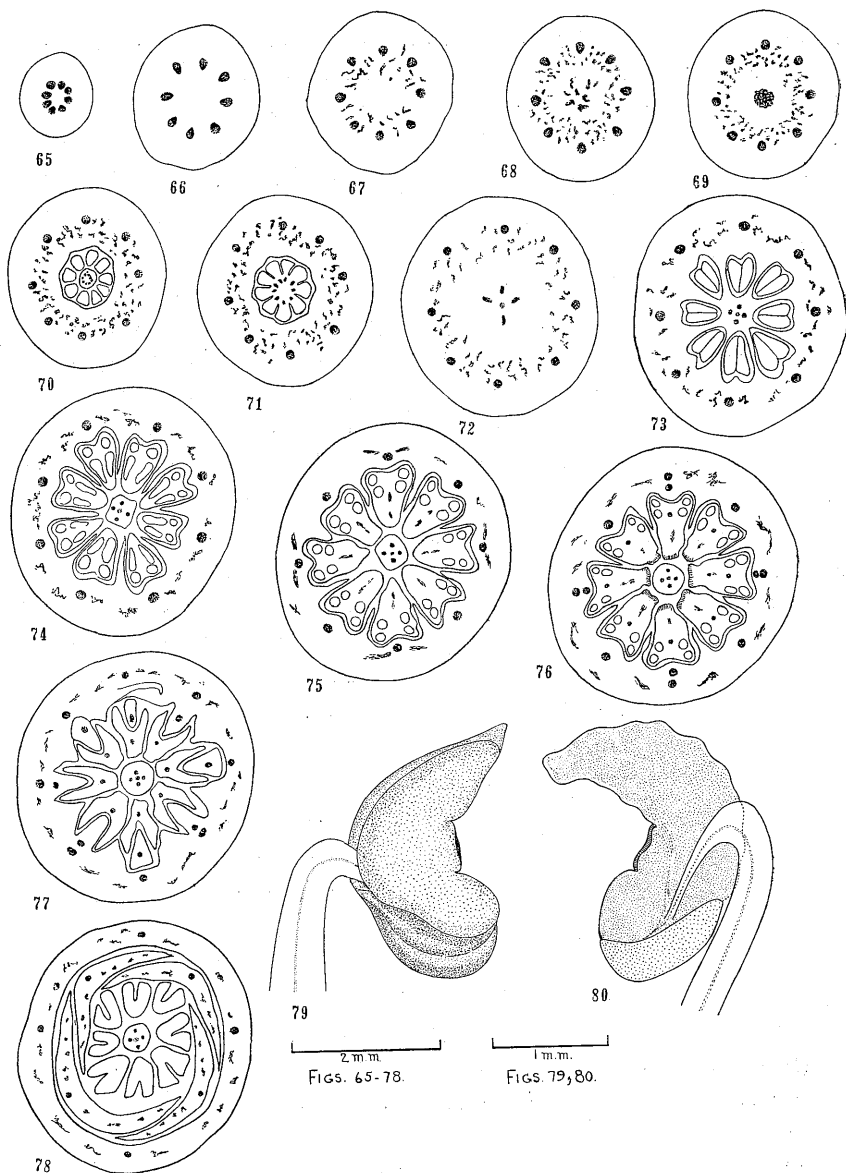
Figs. 38-50. *Osbeckia crinita*. Cross sectional figures representing various levels from pedicel upwards in the flower.

bundles function as petal midribs (Figs. 10, 11, 20-23, 36, 37). The behaviour of the common sepal lateral-petal median bundles in *Osbeckia* and *Oxyspora* is similar to *Sonerila* species. They divide tangentially to form the common sepal lateral-petal midribs along the outside (Figs. 48, 61-63) and the anti-petalous staminal traces towards the inside (Figs. 48, 61-63). The laterals of adjacent sepals are demarcated from the former (Figs. 48, 61, 62). The stamens and perianth parts separate from the floral tube at successive levels. The bundles supplying the perianth parts divide to form smaller bundles in the respective organs (Figs. 11, 12, 23-25, 32, 49, 50, 63, 64).



Figs. 51-64. *Oxyspora paniculata*. Cross sectional figures representing various levels from pedicel upwards in the flower.

Memecylon differs from the rest of the taxa in its course of vascular supply to the different floral parts. The eight bundles at the base of the inferior ovary diverge out (Figs. 65, 66). A large number of unconnected vascular bundles are seen at this level (Fig. 67). Some of these converge



Figs. 65-80. *Memecylon sylvaticum*. Figs. 65-78. Cross sectional figures representing various levels from pedicel upwards in the flower. Fig. 78. Whole mount of a stamen. Fig. 80. L.S. of anther.

towards the center forming a solid core of vascular tissue (Figs. 68, 69) which in turn splits into eight separate bundles. These bundles enter the placental column and traverse up towards its top where the eight ovules are attached, thus forming their supply. When there are more than eight ovules, one or more of them passing through the placental column undergoes branching (Figs. 70, 71). Unlike the previous genera, the ventrals in *Memecylon* get consumed in the ovular supply.

Above the level of the ovarian cavity, four bundles converge towards the center (Figs. 72, 75). Judging from their position they can be interpreted as dorsal carpellary traces which become distinguishable at this level. These extend upward and form the stylar supply (Figs. 73-78). Among the several bundles traversing the floral tube, those destined to supply the perianth and stamens are prominent than the remaining ones (Figs. 67-77). The bundles along the radii of the dorsal carpellary traces represent the common sepal-stamen traces while the alternating ones, petal-stamen traces with which the sepal laterals are adnate.

Discussion The epigynous flowers of Melastomataceae studied in the present investigation are tri- or tetramerous. The present comparative study on the floral morphology of six members of Melastomataceae supports that the inferior ovary represents extreme connation of the basal portions of the floral parts and their traces.

From the ring of vascular tissue at the base of the inferior ovary, the supply to the different floral parts is differentiated. In the first instance two rings of bundles are formed; of these, the inner function as the common ventrals while the peripheral ones represent the common bundles for the other floral parts like the sepals, petals and stamens. Until the organization of the ventrals, the bundles at the base of the inferior ovary can be regarded as stelar and above the level of origin of ventrals they are appendicular. Since the bundles that traverse the floral tube represent the conjoint bundles of sepals, petals and stamens, the 'Ovary Wall' in the taxa investigated can be interpreted as appendicular thus supporting the appendicular theory of the nature of the inferior ovary.

The placentation judging from the position of the common ventrals before and after the organization of the placental supply, can be regarded as anatomically parietal (Puri, 1952). *Memecylon* differs from the rest of the taxa

investigated in having a free central placenta bearing 8-10 ovules at its top.

In the independent origin of the dorsal carpellary traces, *Oxyspora paniculata* resembles *Rhexia virginica* (Eyde and Teeri, 1967). The dorsal carpellary traces fade away towards the top of the ovary and the ventrals alone constitute the stylar supply, a condition also reported by Eyde and Teeri (1952) in *Rhexia virginica*. In *Memecylon*, however, the ventrals are completely used up in the ovular supply and only the dorsal bundles of the ovary constitute the stylar supply. In this respect it resembles *Aciotis fragilis* (Morley, 1953).

The single-traced stamens are bent in the bud condition. The appendages of the anther which are the prolongations of the connective are characteristic of certain genera of the family. Since the vascular supply of the connective is continued into the appendage, this feature further supports that it represents the prolonged connective. The petals are traversed by a single bundle and show contorted aestivation while the sepals have 3 bundles and valvate. In *Osbeckia* and *Memecylon*, the sepals, after separation from the floral tube, remain united for a short distance at the base.

Literature cited

- Eyde, R. H. and Teeri, J. A. (1967): Floral anatomy of *Rhexia virginica* (Melastomataceae). *Rhodora*, 69: 163-178. Morley, T. (1953): The genus *Mouriri* (Melastomataceae); a sectional revision based on anatomy and morphology. *Univ. Calif. Publ. Bot.* 26: 223-312. Saunders, E. R. (1937): Floral Morphology. Vol. II. Cambridge. Van Heel, W. A. (1958): The pistil of *Bertalonia marmorata*. *Blumea* 4 (Suppl.): 144-148. Wilson, C. (1950): Vascularization of the stamen in the Melastomataceae with some phyletic implications. *Am. J. Bot.* 37: 431-444.

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インド産ノボタン科植物の6種について、花部の比較解剖学的知見を述べる。いずれも花は整正、両性であり、上位花である。各部の接着は維管束にも及んでいる。本研究は下位子房の附属器官起源説を支持すること次の如くである：*Oxyspora paniculata* では心皮背面の維管束は独立している。胎座は *Memecylon* 属では独立中央胎座であるが、他は解剖学的には側膜胎座に属する。花柱の維管束は心皮の共通腹条からのものであるが、*Memecylon* 属だけは心皮背面条から供給される。雄蕊は花蕾中で

特異な曲りを示すが、どれも 1 本の維管束が走るだけである。*Osbeckia*, *Oxyspora*, *Memecylon* の各属での葯には葯隔の伸長による附属体があり、*Memecylon* 属の附属物には蜜腺がある。花弁は開花前には回旋（片巻き）し、其の葉跡は 1 本しかない。がく片は蕾時に敷石状（擦り合わせ状）に配列し、3 本の葉跡が入る。

○アキノキリンソウの白花品（浅井康宏） Yasuhiro ASAI: On a white-flowered form of *Solidago virgaurea* L. ssp. *asiatica* Kitam.

鳥取市在住の清末忠人氏は、同市の鳥取砂丘附近で白花のアキノキリンソウを採集された。本品については、嘗つて故檜山庫三氏が、同氏から送付されたものに基づき新品種と考定されていたが、未発表となっていたものである。頃日、筆者は清末氏から、その副品に当る標本の提供を受けたが、故檜山氏の意志を尊重し、筆者の責任で次のように記載しておきたい。檜山氏も書信の中で、“黄花品の白花は珍しい”と述べておられるが、アキノキリンソウの白花の傾向のある一品と思われる。なお、本種の白花品については、既に飯沼慾斎の草木図説 17 卷、第 36 図アキノキリンソウの解説中に“又一種白花の品あり”と記されており、従って古くから注意されていたことがわかる。御教示下さった久内清孝先生に深謝する。因みに、本品の和名シロバナアキノキリンソウは清末氏の命名に係る。

（東京歯科大学）

Solidago virgaurea L. ssp. *asiatica* Kitamura form. **albescens** Hiyama in lit.
Flores albescentes. Cetera ut in typo.

Nom. Jap. Shirobana-akinokirinsō (T. Kiyosue, 1960).

Hab. Honshū; On sunny sandy places of Tottori dune, Prov. Inaba (Nov. 3, 1960, T. Kiyosue—type in TI).

○高等植物分布資料 (61) Materials for the distribution of vascular plants in Japan (61)

○シムラニンジン *Pterygopleurum neurophyllum* Kitag. 関東・大阪・四国・九州の一部に自生が知られているが、筆者は 1968 年 8 月愛知県知多郡美浜町野間で、本種を数株見つけることができた。自生地は波打ち際からわずか 10 m 余りの湿地で、セリ・チゴザサ・シロバナサクラタデ等と混生していた。あきらかにこの湿地は、かなり塩分を含むものと思われ、本種の生態上興味深い。尚、標本を確認していただいた杉本順一氏にお礼を申し上げます。

（愛知教育大高校課程生物 中西弘樹）